

PATENT SPECIFICATION (11)

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(54) MANICURING UNIT

(71) We, BRISTOL-MYERS COMPANY, a Corporation organised and existing under the laws of the State of Delaware, United States of America, having offices located at 345 Park Avenue, New York, New York 10022, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to motor driven manicuring machines and is concerned, more particularly, with hand-held, battery-powered abrading and polishing apparatus for grooming nails at low surface speeds.

A wide variety of attempts have been made for the provision of motor-powered abrading and polishing devices for fingernails and toenails. These have included both manipulable or portable units employing rotary abrading units and larger, static or table-type units.

These latter, table-top units typically are driven electrically and include one or more apertures for providing access and orientation of a fingernail with regard to the abrading surface. Units of this type are effective for the abrasive filing of fingernails but are generally unsuitable for use in grooming or trimming toenails.

Furthermore, these static units tend to be rather large and heavy, so that their use is generally limited to a specific location at which they consume a considerable amount of room on table tops or shelving. Accordingly, although these relatively large units may be constructed with relatively large drives to move the abrading surface at desirable speeds, they are quite limited in their versatility of use, particularly in terms of location and convenience for grooming different types of nails.

Prior forms of small, rotary manicuring units have employed small, high speed motors in order to achieve the desired compactness. Since motor torque is a function of the size of the motor and, especially,

since the surface speed of a rotating unit is directly related to the tool diameter, for a given speed, the tools or abrasive bits of such prior units typically have been limited in diameter to less than one-half inch.

These prior units have not been well accepted by consumers for several reasons. The very high speeds and the sensible torque reaction have made it quite difficult for an untrained individual to control such units. The tendency is for the abrasive bit to recoil or to run itself away from the nail. This made it almost necessary to provide additional guidance for the controlling hand, such as by the use of a second hand as an additional guiding means. While this is feasible when the units are used by a second person, it is clearly unsuitable when it is desired to use the unit for self-manicure.

These high-speed, small-diameter bits also involve the danger or tendency to groove or to "scallop" the nail if they are presented against the nail with too much force or for too long a time. Therefore, any distraction or inattention frequently would result in the formation of a small-diameter arc-shaped deformation of the nail, in contrast to the desired sculpturing being attempted.

Consequently, prior manicuring units have not been found to be entirely satisfactory.

According to this invention we provide a portable manicuring unit comprising

- (a) means for supporting electric power supplying means,
- (b) a motor driven in use by said power supplying means,
- (c) a gear-reduction train and
- (d) a manicuring tool rotatably driven by said motor via said gear-reduction train,
- (e) said manicuring tool having a working surface having a diameter of at least 0.75 inches and not substantially exceeding 1.5 inches, and
- (f) said motor and said gear reduction train being correlated to provide a maximum speed for the peripheral working surface of the tool not substantially exceeding 30 inches per second.

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At a preferred rotational speed of about 360 rpm and with an abrasive accessory having a diameter of 1.20 inches, the manicuring unit of the present invention has been found to overcome the deficiencies of the prior art and to provide an ease of use comparable to the familiar emery board with additional convenience which has not been heretofore available to the consumer.

The unit is preferably of the type described and claimed in our copending Application No. 29631/78 (Serial No. 1,548,559), wherein the unit comprises a portable manicuring unit comprising

(a) an elongated casing,
(b) an output shaft at a first end of said casing and mounted for rotation on an axis substantially coaxial with the longitudinal axis of said casing.

(c) means in said casing adjacent the second end thereof for supporting at least one elongate dry cell or like electric power supplying means with its longitudinal axis substantially coincident with the axes of said casing and said output shaft.

(d) a motor driven, in use, by said power supplying means in said casing intermediate said power supplying means and said output shaft and mounted with its shaft radially offset from the axis of the casing, and

(e) a gear-reduction train in driving engagement between said motor and said output shaft.

A better understanding of the invention may be derived from the following description and accompanying drawings of one form of the invention, in which:

Figure 1 is a sectional side view of the preferred form of manicuring unit according to the invention;

Figure 1a is a view similar to Figure 1 and showing the manicuring unit in operating configuration;

Figure 2 is a cross-sectional view taken along lines 2-2 of Figure 1 and showing the gear reduction train;

Figure 3 is an exploded view of the motor and gear train and viewed from a perspective point to the left of Figure 2;

Figure 4 is an exploded view of the motor and its mounting and viewed from a perspective point rearward from that of Figure 3;

Figure 5 is a plan view, partly in section, of the structure of Figure 4;

Figure 6 is an exploded view showing the switch contacts in relation to their mounting projections;

Figure 7 is a perspective view of the assembled switch;

Figure 8 is a sectional view taken along the lines 8-8 of Figure 7; and

Figure 9 is a perspective view of contacts for engaging the batteries and the wall upon which the contacts are mounted.

As shown in the drawings, the preferred

form of manicuring unit of the present invention comprising a casing 1 of generally cylindrical cross-section throughout its length and including a handle portion 2 engaging a housing portion 3 by means of a threaded joint 4. The end of the housing remote from the handle 2 is closed by an end member 5 secured therein by a threaded joint 6 and having an axial aperture and a dust seal 7 therein.

The handle 2, housing 3, end member 5 and other exposed portions of the unit preferably are formed of a polyester or another material which is resistant to the solvents normally occurring in manicuring materials, such as nail polish remover.

The handle has a dual taper on its exterior surface, for ease and security of manipulation, and includes an axial bore 8 which is closed at the smaller end of the handle by an end cap 9.

The end cap 9 is suitably secured in the handle, such as by ultrasonic welding, and includes an annular projection 10 which extends into the bore 8 and which includes a chamfer 11 to receive and align the closed end of a battery tube 12 within axial bore 13 of the projection 10. An annular abutment 14 is provided in the bore 13 to engage and establish the longitudinal position of the battery tube 12.

The threaded portion 15 of the housing 3 which forms the threaded joint 4 within the bore of the handle 2 is provided with a cylindrical recess 16 which surrounds the open end 17 of the battery tube 12 when in the assembled position. The housing 3 includes a rectangular boss 18 which is positioned along the common, central axis of the handle 2, housing 3 and battery tube 12 and within the cylindrical recess adjacent the rim 17 of the battery tube 12.

The rectangular boss 18 has an aperture 19 which receives and mounts a contact member 20 therein in a position to engage the positive terminal 21 of the second of two batteries 22. The batteries are biased towards engagement with the contact by means of a conventional spring 23 within the closed end of the tube 12.

The contact member 20 is formed of flat spring stock with four legs 24, 24¹, 25 and 25¹ folded back from the central portion 28 with two opposite legs 24 with 24¹ having angular flanges 29, 29¹ perforated therein. In position, the angular flanges 29, 29¹ abut against a recessed face 30 of the housing and serve as retainers for the contact 20. The remaining two legs 25 and 25¹ of the contact initially extend at right angles to the legs carrying the angular flanges, thereby engaging the surface or face 31 of the boss to retain the contact in position against the bias of the battery spring.

The two legs 25 and 25¹ of the contact

bearing against the face 31 of the boss portion are bent into a U-shaped relationship and extend through apertures 32, 32¹ in the housing wall to a position emergent from the wall adjacent the angular flanges 29 and 29¹. One of these emergent contact legs subsequently has a lead wire 26 secured thereto by suitable means such as soldering and which carries a terminal clip 27 for engagement with a motor terminal. The central portion 28 of the contact is ruptured by means of a star-shaped punching 34 to provide four sharp points 35 of contact directed against the battery terminal 21.

Within the recess portion 16, the housing carries a negative contact member 36 which engages the rim 17 of the conductive battery tube 12 and is therefore in electrical communication with the negative terminal of the batteries via the spring 23. The negative contact 36 is formed of flat spring stock with a rectangular aperture 37 positioned centrally therein for receiving the generally rectangular boss 18 in the recess 16. The negative contact has opposed legs 38 and 39 which are bent into U form and which extend through apertures 40 and 41 in the housing wall and carry angular flanges 42 punched therein for engaging and locking against the housing wall 30 to retain the contact in position. The negative contact 36 also includes a pair of L-shaped extensions 43 and 44 on opposite sides of the aperture and which have their terminal portions 45 and 46 extending in opposite directions and bent outward away from the central portion and the bottom wall of the recess, so that they are self-biased into engagement with the rim 17 of the battery tube. A negative lead wire is subsequently secured to one of the legs 38 or 39 of the negative contact, such as by soldering, and is provided with a terminal clip 47.

Adjacent its end remote from the handle 2, the housing 3 carries a transverse bulkhead 48 which is retained against and between a plurality of abutments 49 within the hollow portion of the housing and a shoulder 50 on the threaded end member 5. Preferably, the abutments 49 are formed by a plurality of arcuate ribs which are directed inwardly from the interior wall of the hollow portion of the housing. The bulkhead includes opposed notches 51 and 52 in its periphery and which receive projections 53 and 54, respectively, extended inwardly from the inner wall of the housing to lock the bulkhead against rotation.

The bulkhead has a projection 55 extending rearwardly in the direction of the handle and including a pair of fingers 56, 56¹ at an upper level and spaced from each other on opposite sides of a lower level, single projection 57. The lower single projection 57 receives and mounts a flatspring stock,

static switch contact 58. The static switch contact 58 is a flat, elongated strip carrying a pair of lateral projections 59, 59¹ which are bent downwardly for a distance and then again bent inwardly toward each other and again upwardly toward the main portion of the strip for their ends 60 and 60¹ to receive and resiliently engage the lower projection. At its end adjacent the end wall, the static switch contact is bent downwardly and is dimensioned to receive and engage the terminal clip 47. At its opposite end, the static switch contact is bent upwardly and terminates in a plane which is parallel to its original plane and spaced upwardly from the main portion of the rearward projection of the bulkhead.

The paired fingers 56, 56¹ of the rearward projection of the bulkhead carry a flexible, relatively moveable switch contact 61 which is formed of flatspring stock and which includes a generally elongate main portion 62 having a pair of lateral extensions 63, 63¹ which are bent downwardly a distance and then toward each other and again upwardly toward the main body portion to span and for their ends 64, 64¹ to resiliently engage and lock the contact on the spaced fingers 56 and 56¹. The opposite ends of the longitudinal main portion of the flexing switch contact 61 are bent upwardly away from the main portion and terminate in short, reversely-bent ends 65 and 65¹.

In the region overlying the switch contacts, as viewed in Figure 1, the housing 3 has an oval button-aperture 68 which is internally surrounded by a generally flattened portion 69 of the inner wall. A button member 70 having a generally oval body 71 surrounded by a flat flange 72 and which tapers inward at its forward and rearward ends is engageable against the flat inner portion of the housing when the button is fully inserted radially outwardly in the oval aperture from within the housing.

In its end adjacent the bulkhead, the button has a notch 73 therein which is sized to receive the adjacent angular portion of the moveable switch contact 61 adjacent the reversely-bent end 65 when the button is depressed and moved forward and away from the handle to the "on" position, as best shown in Figure 1a. The bulkhead carries a generally rectangular recess 74 therethrough for receiving the forward edge of the button when the button is thus moved to the forward position.

Diametrically opposite the rectangular aperture 74 and, therefore, the switch assembly, the bulkhead has a cylindrical aperture 76 which is radially offset from the common center line of the housing and the remainder of the unit. Flanking the aperture 76, the bulkhead has a pair of slots 77 and 77¹ extending chordally from its edge in-

wardly and aligned with the center line of the offset aperture 76.

The aperture 76 receives the bearing housing 78 of a low-voltage, high rpm motor 79 in a press-fit relationship. The opposite bearing housing 80 of the motor is engaged by a U-shaped portion 81 of a motor-mounting yoke 82 formed of a spring-grade wire and having opposed legs 83, 83¹ extending forwardly on opposite sides of the motor and through the opposed slots 77, 77¹ in the bulkhead. The lateral legs 83, 83¹ each have transverse bends 84, 84¹ extended toward each other and terminating in rearwardly extending pin-ends 85, 85¹ which are receivable in a pair of apertures 86 and 86¹ adjacent the slots 77 and 77¹. The motor casing is locked against rotation by a bulkhead pin 66 engaging an aperture 67 in the casing. The motor is, therefore, positioned and supported by both the fit in the aperture 76 and the tension of the yoke. Preferably, the slots 77 and 77¹ are tapered downwardly, as at 87, away from the center line of the bulkhead to permit the yoke to swing downwardly for insertion of the motor.

On its side opposite from the motor 79, the bulkhead carries a forward extension 88 which includes a generally cylindrical gear chamber 89, formed as an extension of the aperture 76, and an axle extension 90 which is coaxial with the housing and the remainder of the assembly. As best shown in Figure 3, the forward extension 88 is partially cut away along the cylindrical gear chamber 89 to provide access to a pinion gear 91 mounted on the motor shaft 92 therein. A cluster gear 93 is mounted on a pin 94 pressed in a recess 95 in the bulkhead and located to provide engagement of the larger of the cluster gears with teeth of the pinion gear 91. The smaller of the cluster gears is thus positioned to engage the internal teeth 96 of an integral output gear 97 and output drive shaft 98 which is journaled on a pin 99 pressed into a recess 100 in the axle extension 90 and coaxial with the remainder of the unit. The pinion 91, cluster 93 and internally-toothed ring gear 97, therefore, form a gear reduction train which reduces the speed of the output shaft by a ratio of 17 to 1 from the relatively high speed low torque output of the motor, and therefore, provide a shaft output speed in the range suitable for manicuring service, as discussed more fully hereinafter.

The output shaft 98 has an annular shoulder 101 which is positioned to engage a ring 102 on the end wall 5, to limit outward travel of the gear and shaft unit. In service, the pin 99 acts as a thrust bearing when pressure is applied along the output shaft.

The output shaft 98 is hexagonal in cross-section and has flats 103 to provide driving

abutment with abrading and polishing accessories, each of the flats 103 having a detent 104 for receiving the locking leg 105 of a generally V-shaped retainer-spring 106 within an accessory adapter 107 which is thereby removably positioned on the output shaft. The accessory adapter 107 includes a hexagonal bore 108 for receiving and engaging with the flats 103 of the output shaft and includes a forwardly extending cylindrical portion 109 for receiving an abrading or polishing unit 110. A button seal 111 having a flange 112 bearing against the forward surface of the abrading unit 110 secures the unit 110 against a forward-facing shoulder 113 on the accessory adapter 107 and is secured to the cylindrical portion 109, such as by ultrasonic welding.

The preferred form of abrading accessory shown in Figure 1 includes a substantially flat, radial forward face 114 and a generally conical rear face 115 which converge toward a thin, generally cylindrical, peripheral surface 116, all of which may be used in the grooming procedure, as desired.

A generally cylindrical cover 117 is provided to enclose the final drive and accessory during periods of non-use and engages an annular shoulder 118 on the housing end wall 5 by means of a plurality of circumferentially-spaced, inwardly-extended raised portions 119.

Assembly of the Preferred Embodiment

In assembly of the unit, the positive and negative contacts 20 and 36 are positioned upon the housing and are locked in their appropriate positions by the angular flanges 29 and 42.

With the yoke positioned on the bulkhead and lowered against the tapers 87 of the slots 77, the cluster gear is then positioned on its mount on the bulkhead and the motor, with the pinion gear mounted on its shaft, is subsequently pressed into the aperture, with the cluster gear being rotated as required to provide proper meshing with the pinion gear. The U-shaped portion of the yoke is then snapped onto the closed bearing of the motor.

The static switch contact 58 is then locked upon the lower, single-extension 57 of the bulkhead projection and the moveable switch contact 61 is locked on the spaced fingers 56, 56¹. The negative motor terminal is then secured to the moveable switch contact 61 by means of a suitable wire.

Upon completion of the bulkhead assembly with its motor, drive and switch mechanism, the resultant bulkhead sub-assembly is associated with the housing; the positive motor terminal is connected to the central contact terminal clip 27, and the negative terminal clip 47 is connected to the static switch contact 58. The switch button is then

inserted in the housing in a position in which it is fully extended through its aperture, and the bulkhead and its assembly are then inserted in the housing, with the moveable spring contact thereafter engaging with and maintaining the proper positions of the switch button. The end wall 5 is then threaded into the housing and completes the housing assembly.

- 10 The handle portion of the casing is then assembled with its end cap and receives the battery tube mounted in the recess in the end cap. After insertion of the batteries, the handle assembly is threaded upon the threaded portion of the housing.

Operation of the Preferred Embodiment

- 20 With the unit thus assembled with its batteries, an accessory is selected and installed on the output drive shaft by a simple sliding action therealong until the locking leg of the detent spring 106 engages a notch 104 on one of the flats 103 of the output shaft.

- 25 Upon depression of the button 70, the moveable spring contact 61 then is flexed into engagement with the stationary contact 58 and closes the circuit to drive the motor. The depressed button is thereafter moved forward to a position in which its recess 73 engages the angular portion of the flexed spring and its forward edge is received within the recess 74 of the bulkhead. During the sliding motion, the angular portion of the flexing contact 61 is flexed open against the stationary contact 58, until it is received within the button notch 73, at which point it then springs back to its original shape, with the consequent relative motion between the moveable and stationary contacts thus providing a wiping action which serves to maintain a clean contact area between the two contacts.

- 45 With the switch locked in the on position and the button flange secured in the recess of the bulkhead, the manicuring unit may then be held or supported from any portion of its casing, without concern for the position of the button and without the need for any continued finger pressure upon the switch button. Thus, the unit may be oriented in any desired angle with regard to the nails to be groomed. This capability is of special advantage in cases in which the unit is to be used by an individual on the individual's own body, which is expected to be a major area of service of the new manicuring unit.

- 50 The grooming of the nails may progress through a series of successive operations such as coarse filing, fine filing and buffing, with a simple interchange of the accessories, while the switch is off, in between the successive grooming stages. It is to be understood that a variety of accessories may be associated with the manicuring unit includ-

ing coarse abrading heads, fine abrading heads, buffing surfaces, or the like and in a wide variety of shapes and diameters.

In this respect, it should be noted that the provision of the gear reduction train, between the high rpm battery-motor and the ultimate accessory surface, provides the desired peripheral speed of the working surface of the accessory, thereby limiting the rate of abrasion or buffing to a comfortable level at which unskilled individuals may readily employ the manicuring unit without the assistance of other persons and without the probability of damage as a result of their initial lack of skills in its use.

It has been found that the working-surface speed of the abrading or polishing surface is to be limited to a maximum of about 30 inches per second for acceptable control by the average human. The preferred range of surface speeds, in terms of facility of use and control, has been found to be that of from minimal speed to an initial maximum of 20 to 25 inches per second in the absence of a load. Under working load, of course, a reduction of this initial maximum speed will occur and will provide a working speed of about 15 to 20 inches per second, depending upon the pressure with which the surface is applied against a nail.

The low rpm output, of about 360 rpm, which is achieved with the manicuring unit of the present invention, in conjunction with the preferred, relatively large-diameter accessories, in the range of 0.75 to 1.5 inches diameter, thus provide the desired surface speeds of the working surface.

It will be apparent that the surface speed of the conical rear face 115 and the radial forward face 114 of the preferred accessory shown in Figure 1 will vary from the periphery toward the center, so that a range of abrading speeds will be available to the user.

However, with the preferred outer diameter of about 1.20 inches and the speed of 360 rpm, the no-load surface speed of the outer edge 116 is about 23.5 inches per second, which has been found to be an especially effective surface speed and an excellent combination of rotational speed and tool diameter.

It is to be understood that the accessories may have a full, forward working face, unobscured by a button 109, which will provide a range of surface speeds from the desired maximum down to a very low minimum immediately adjacent the center of the face. This structure is considered to be of especial value for polishing.

However, for "filing" purposes, the thin-periphery abrading wheel shown in Figure 1 is considered to be of special advantage, since it provides for use of the wheel beneath the edge of the nails for perfection of the

manicure by removal of any burrs or undesirable edge forms which may be encountered. The thin peripheral edge 116 intermediate the radial and conical faces thus provides an abrasion-filing tool which may be used with great visibility on the several areas and surfaces of the nail without the need for frequent exchange of tools between the surfaces.

Furthermore, the facility of use of the new manicuring unit and the nature of the preferred abrading accessory make it possible to apply any of the working surfaces to the nail without changing the direction of filing and the attendant risk of provoking splitting of the nail. Accordingly, any of the three working surfaces may be oriented to engage the nail in the desired direction, whether by inversion or reversing of the unit or by re-orientation of the nail itself with regard to the position in which the tool is held.

It is to be understood that the present invention is not to be construed as being limited in all its aspects to any specific shape of accessory. However, it is important to the present invention that the accessories have an outer diameter of the working surface which is at least 0.75 inches and not substantially exceeding 1.5 inches, while a working surface diameter of about 1.20 inches is preferred.

Accordingly, it is apparent that the present invention provides for self-manicuring with rotating accessories which are of sufficient diameter to avoid the undesirable consequences of prior units, such as grooving or scalloping of the nails, and at working-surface speeds which are both comfortable and easily controlled by the user.

The coaxial relationship of the casing and working accessory further provides an extremely facile unit which is so easily grasped and controlled that it is quite suitable for self-manicure of toenails without requiring contortion of the individual's body.

Therefore, the present invention provides an especially advantageous manicuring unit and system which avoids the disadvantages of the prior art units and which affords easy and accurate, one-handed control which has been unattainable heretofore.

It is to be understood that the term "manicuring", as used herein and in the appended claims, is applicable to the nails of both the hand and the feet and that the term has been so employed to avoid unnecessary repetition and profusion.

Various changes may be made in the details of the invention, as disclosed, without sacrificing the advantages thereof or departing from the scope of the appended claims.

WHAT WE CLAIM IS:—

1. A portable manicuring unit comprising

(a) means for supporting electric power supplying means,

(b) a motor driven in use by said power supplying means,

(c) a gear-reduction train and

(d) a manicuring tool rotatably driven by said motor via said gear-reduction train,

(e) said manicuring tool having a working surface having a diameter of at least 0.75 inches and not substantially exceeding 1.5 inches, and

(f) said motor and said gear reduction train being correlated to provide a maximum speed for the peripheral working surface of the tool not substantially exceeding 30 inches per second.

2. The portable manicuring unit of Claim 1 in which the motor and gear-reduction train are correlated to provide a peripheral working surface speed of about 23 inches per second.

3. The portable manicuring unit of Claim 1 or 2 in which said motor and said gear-reduction train are correlated to provide an output shaft speed of about 360 rpm.

4. The portable manicuring unit of Claim 1, 2 or 3 in which the working surface has a maximum diameter of about 1.2 inches.

5. A portable manicuring unit according to any one of the preceding claims comprising

(g) an elongated casing, and

(h) an output shaft at a first end of said casing and mounted for rotation on an axis substantially coaxial with the longitudinal axis of said casing,

means in said casing adjacent the second end thereof, for supporting

at least one elongated electric power supplying means positioned with its longitudinal axis substantially coincident with the axes of said casing and said output shaft,

the motor being positioned in said casing intermediate said power supplying means and said output shaft and mounted with its shaft radially offset from the axis of the casing, and

the gear-reduction train being in driving engagement between said motor and said output shaft.

6. The portable manicuring unit of Claim 5 in which said casing is substantially circular in cross-section throughout its length.

7. The portable manicuring unit of Claim 5 or 6 including a switch in said casing positioned generally opposite said motor.

8. The portable manicuring unit of Claim 5, 6 or 7 in which said gear train includes a pinion gear on said motor, an internally-toothed ring gear coaxial with and in direct-drive relationship with said output shaft, and intermediate gear means in driv-

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(b) a motor driven in use by said power supplying means.

- (c) a gear-reduction train and
- (d) a manicuring tool rotatably driven

(e) said manicuring tool having a work-

(f) said motor and said gear reduction train being correlated to provide a maximum

2. The portable manicuring unit of Claim 1 in which the motor and gear

3. The portable manicuring unit of Claim 1 or 2 in which said motor and said

4. The portable manicuring unit of Claim 1, 2 or 3 in which the working sur-

5. A portable manicuring unit according to any one of the preceding claims comprising

(g) an elongated casing, and

(h) an output shaft at a first end of said

(ii) an output shaft at a first end of said casing and mounted for rotation on an axis substantially coaxial with the longitudinal

means in said casing adjacent the second end thereof, for supporting

at least one elongated electric power supplying means positioned with its longitudinal

the motor being positioned in said casing intermediate said power supplying means

the gear-reduction train being in driving engagement between said motor and said

6. The portable manicuring unit of Claim 5 in which said casing is substantially

7. The portable manicuring unit of Claim 5 or 6 including a switch in said cas-

8. The portable manicuring unit of Claim 5, 6 or 7 in which said gear train

...and the





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ing engagement between said pinion gear and said ring gear.

9. The portable manicuring unit of Claim 8 in which the intermediate gear means comprises a cluster gear having a major gear in meshing engagement with the pinion gear and a minor gear in meshing engagement with the ring gear.

10. The portable manicuring unit of Claim 9 in which said ring gear is an integral part of the output shaft, said output shaft is mounted upon a pin axle, and said casing has an end member surrounding said output shaft and having confining means for confining axial motion of said output shaft.

11. The portable manicure unit of Claim 10 in which said confining means includes a ring positioned to engage said output shaft.

12. The portable manicure unit of any one of Claims 5 to 11 in which said output shaft includes a non-circular drive portion and said manicuring tool has a surface complementary to said non-circular drive portion, means being positioned for releasably retaining said manicuring tool on said non-circular drive portion.

13. A portable manicuring unit according to any one of Claims 5 to 12 wherein said casing comprises

(a) a bulkhead adapted to be mounted transversely of the manicure unit,

(b) said bulkhead having a generally flat face having

(c) an aperture therein,

(d) a protruding pin positioned to engage

(e) a motor having a casing portion positioned within said aperture,

(f) said bulkhead having a second face including

(g) a pair of recesses positioned on opposite sides of said aperture,

(h) a pair of slots in said bulkhead and extended inwardly from opposite edges thereof toward said pair of recesses,

(i) a yoke having

(j) a motor-engaging portion and

(k) a pair of legs positionable along said motor and through said slots to protrude adjacent said second face, said legs each having a terminal portion adapted to bear against said second face and engageable in one of said pair of recesses,

(l) said second face having a protrusion including

(m) an axle recess positioned on the center line of the bulkhead and

(n) a lateral gear aperture,

(o) a pinion gear on said motor and positioned adjacent said lateral gear aperture,

(p) a cluster gear rotatably mounted on said second face and having

(q) a major gear in meshing relationship

with said pinion gear through said lateral gear aperture and

(r) a minor gear, and

(s) an output gear mounted on

(t) an axle in said axle recess and having

(u) internal teeth in meshing engagement with said minor gear of said cluster gear.

14. The portable manicuring unit as set forth in Claim 13 in which the bulkhead is substantially circular along its edge.

15. The portable manicuring unit as set forth in Claim 13 or 14 in which the bulkhead aperture is radially offset from the center line of the bulkhead and the bulkhead has a switch-mount projection extended therefrom along the motor and substantially diametrically opposite the offset of said aperture.

16. The portable manicuring unit as set forth in Claim 15 in which the switch-mount projection includes an outer portion and an inner portion positioned radially inwardly from the outer portion, a flexible switch contact mounted on said outer portion, and a static switch contact mounted on said inner portion.

17. The portable manicuring unit as set forth in Claim 16 wherein the casing includes a lateral wall having a button aperture therein adjacent the flexible switch contact.

18. The portable manicuring unit as set forth in Claim 17 in which the flexible switch contact includes an outwardly-extending spring member and including a button in said button aperture and retained therein by said outwardly-extending spring member.

19. The portable manicuring unit of any of the preceding claims in which the manicuring tool includes both peripheral and radial working surfaces.

20. A portable manicuring unit according to Claim 19 wherein the tool includes

(a) a radial working face,

(b) a conical working face, said working faces converging toward

(c) a peripheral working surface intermediate the radial and conical working faces, and

(d) means for mounting said tool for rotation on an axis substantially perpendicular to said radial face.

21. A portable manicuring unit as set forth in Claim 20 in which said peripheral surface of the tool has a diameter of at least 0.75 inches.

22. A portable manicuring unit as set forth in Claim 21 in which said peripheral surface has a diameter not exceeding 1.5 inches.

23. A portable manicuring unit as set forth in Claim 22 in which said peripheral surface has a diameter of about 1.2 inches.

24. A portable manicuring unit as set forth in any one of Claims 19 to 23 in



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which said peripheral surface is substantially cylindrical.

25. A portable manicuring unit according to Claim 1 substantially as described herein.

26. A portable manicuring unit substantially as shown in the accompanying drawings and described herein with reference thereto.

27. A method of grooming a nail comprising

(a) rotating a manicuring tool according to any one of the preceding claims at a

maximum working-surface speed not exceeding 30 inches per second,

(b) presenting to a surface of the nail a circular working-surface of said tool and

(c) gradually re-orienting said circular working-surface along said nail surface.

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